1. Cover page

TEST EQUIPMENT DATA PACKAGE

Effects of Microgravity on Bioluminescence

Research Organizations: Liberty Science Center
251 Phillip Street, Liberty State Park
Jersey City, NJ 07305-4600

William L. Dickenson High School
2 Palisades Avenue
Jersey City, NJ 07306

Principal Investigator: Rosa Catala
Liberty Science Center
201-451-0006 X 1381

Experimenters: Carlo Fajardo
Humberto Guzman
Dickenson High School
201-714-4400

Date: June 11, 2004

2. Change Page

No changes have been made to this document as of June 11, 2004

3. Quick Reference Sheet

Principal Investigator: Rosa Catala

Contact Information: Liberty Science Center
251 Phillip Street, Liberty State Park
Jersey City, NJ 07305-4600
201-451-0006 X 1381
rcatala@lsc.org

Experiment Title: Effects of Microgravity on Bioluminescence

Flight Dates: July 27/28 or July 29/30

Overall Assembly Weight:
Mounting Floor Plate: 10.5 pounds
Test Chambers: 8.74 pounds and 6.24 pounds
Combined weight with contents: 32.1 pounds
Assembly Dimensions: Length 26”, Width 23”, Height 8.5”
Equipment Orientation Request: No special orientation required
Proposed Floor Mounting Strategy: Bolts
Gas Cylinder Request: None required
Overboard Vent Request: No venting required
Power Requirement:
Camera: 12 V, 100 mA
Recorder: 110 V, 38 W
Free Float: No

Flyer Names for Proposed Flight Day:
Prime Team First Flight Day:
Catala, Rosa Q PIF, Signature contact
Guerrero, Marie Q PIF, Signature Jersey City BOE
Charles W. Lloyd, NASA

Prime Team Second Flight Day:
Pane, Emilio Q PIF, Signature Jersey City BOE
Romanaux, Elizabeth Q PIF, Signature LSC
Charles W. Lloyd, NASA

Dove, Kayla Q PIF, Signature LSC
Faber, Betty U, Signature LSC

4. Table of Contents

5. Flight Manifest

Prime Team First Flight Day:
Catala, Rosa Q PIF, Signature contact
Guerrero, Marie Q PIF, Signature Jersey City BOE
Charles W. Lloyd, NASA

Prime Team Second Flight Day:
Pane, Emilio Q PIF, Signature Jersey City BOE
Romanaux, Elizabeth Q PIF, Signature LSC
Charles W. Lloyd

Dove, Kayla Q PIF, Signature LSC
Faber, Betty U, Signature LSC

6. Experiment Background

To understand the true definition of bioluminescence (organisms giving off light for their own benefit) it is necessary in order to distinguish between bioluminescence and similar phenomena. Biological chemiluminescence and iridescence are sometimes confused with bioluminescence. John Lee, from the Biochemistry Department at the University of Georgia, defines biological chemiluminescence as the light given off by biological processes that does not serve a purpose for that organism (414). An example of this is the faint light that is produced when cells divide quickly, such as onion root tip cells undergoing mitosis (Lee 413). Since this resulting glow does not help the onion, it is not considered bioluminescence. Iridescence is different from bioluminescence because it is produced by reflection or refraction of an external light source. Although certain species of beetles and butterflies seem to shimmer, the beetle or butterfly does not produce this light; it comes from external sources such as the sun.

The biological processes to produce bioluminescence are similar for creatures living on land and those in water. Although both terrestrial and aquatic bioluminescent organisms employ luciferin and luciferase to produce light, the structures of the luciferin and luciferase can be different depending on the organism (Lee 396). Luciferin is the broad name encompassing any material that glows when it loses electrons in the presence of luciferase. Luciferase is the enzyme that must be present to facilitate the oxidation (loss of electrons) of luciferin (Biol 3211 Lecture 8-1 5). Bioluminescent organisms produce diverse colors of light because their luciferin and luciferase are chemically different from each other. The color of the light produced depends on whether the organism is terrestrial or aquatic. Terrestrial organisms, such as fireflies and railroad worms, tend to produce red, yellow or green light. Aquatic organisms usually produce blue-green or green light because these colors travel well through the water without being absorbed, therefore enhancing the ability to be seen (Bioluminescence Questions and Answers 4).

Our goal in this experiment is to find out whether the microgravity environment encountered during space flight will affect the bioluminescence reaction. It is a preliminary experiment to experiments that might be conducted in space..

7. Experiment Description

This experiment investigates the bioluminescence chemical reaction in microgravity. It employs the chemicals luciferin and luciferase. Luciferase is an enzyme that catalizes the oxidation of luciferin, resulting in the production of light. Small amounts of luciferin will be injected into the luciferase solution by means of a syringe during microgravity. A camera will record the reaction time and a light meter will measure the intensity of the light produced. We expect a reduction in the initial reaction time during microgravity.

8. Equipment Description

Experiment Chamber – A 1/4 inch aluminum base plate will be bolted to the floor. It will hold a light-sealed aluminum experiment chamber. A second aluminum box mounted to the plate will hold the experiment supplies. It will also contain the Freez Pack bags to chill the chemicals.

Syringe – A syringe will be used to manually insert the luciferin into a vial of luciferase and initiate the reaction.

Camera – A camera will be used to record the reaction time of the chemicals and observe any complications that may occur during the experiment. The camera is a PC-182XS CCD Camera. Its dimensions are 25 X 25 X 30mm.

Digital Light Meter – The light meter operates on a 9V battery. It is 131X70 X 25 mm in size and has a mass of 210 grams including the battery.

Video Recorder – The video signal from the PC-182XS camera will be recorded with a Sony GVD-2000 Digital 8 Video Walkman VCR. Its dimensions are 14.9 X 5.8 X 12.7 cm. It has a mass of 0.65 kg.

Power Strip with Surge Protector – The power strip will have a kill switch.

Freez Pak – Commercial reusable ice substitute for chilling the luciferin prior to its use. According to the manufacturer, the packets are "filled with a NON-TOXIC freezable gel, which is totally safe." Its dimensions are 9.5 X 19.1 X 1.3 cm and it has a mass of 210 grams.

Ground Equipment

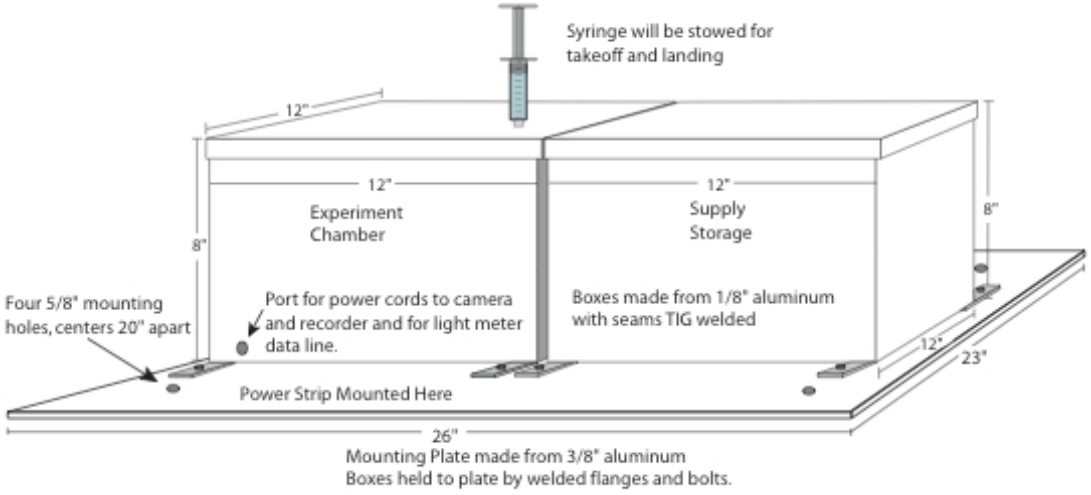
The ground equipment will consist of a cooler for pre-flight storage of chemicals.

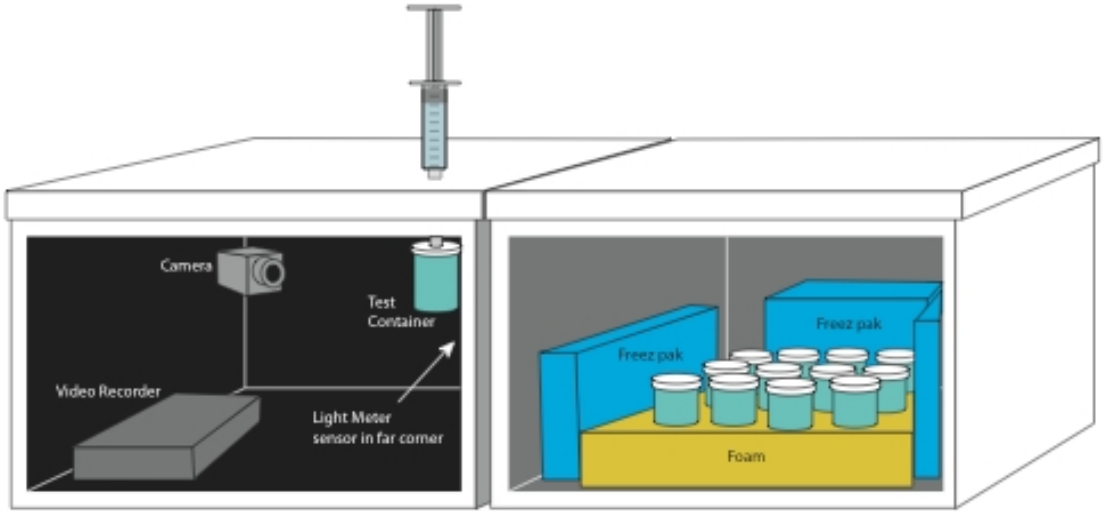
Equipment Layout

We have no preference on the specific location or orientation of the experiment in the aircraft fuselage. A base plate will be placed on the floor and anchored with four bolts.

9. Structural Analysis

The apparatus consists of two aluminum boxes mounted on to a floor plate. One box holds the experiment and the other holds experiment supplies. The boxes are attached to the floor plate with welded flanges and bolts. A surge-protected power strip will be affixed to the floor plate and connected to the aircraft's power system.





Cutaway View of Box Interiors

G-Load Specifications:

Pull Testing was performed on all structural components of the experiment. Test load levels were determined by measuring individual component weights and multiplying those weights by the appropriate g load. The structure was then tested by hanging weights of a greater magnitude than the calculated g load from the structure at its approximate center of gravity. One or two concrete slabs each weighing 91.6 lbs were used for the tests on the base plate. The component was given a "pass" rating if no joint failures or significant component deformations were observed. Pull testing was performed on June 10 and 11, 2004 by exhibit fabrication staff of the Liberty Science Center.

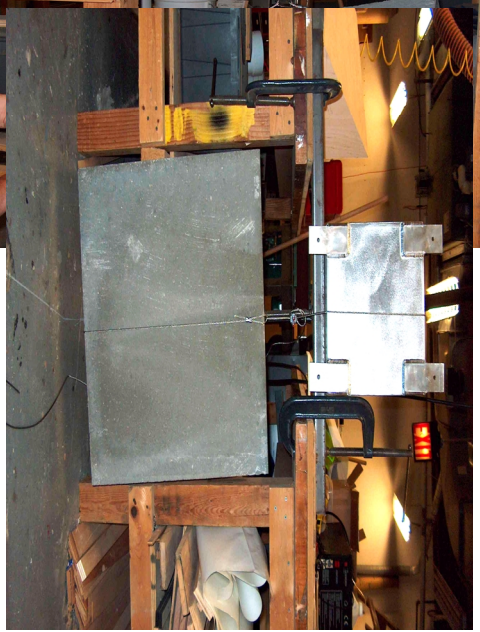
Pull Test Results

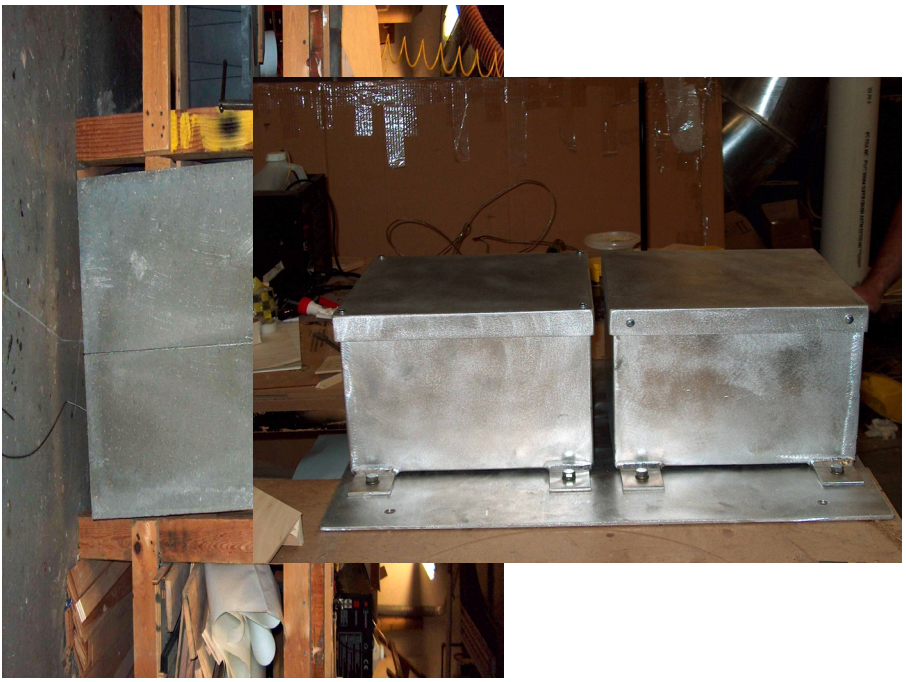
Component Tested	Weight	g load	Calculated load	Actual Load	Pass/No Pass
Floor Plate	10.5 lbs	9 g fwd	94.5 lbs	183.2 lbs	Pass
		6 g down	63 lbs	183.2 lbs	Pass
		2g side	21 lbs	183.2 lbs	Pass
		2 g up	21 lbs	183.2 lbs	Pass
Experiment Chamber	8.74 lbs	9 g fwd	78.7 lbs	91.6 lbs	Pass
		6 g down	52.44 lbs	91.6 lbs	Pass
		2g side	17.48 lbs	91.6 lbs	Pass
		2 g up	17.48 lbs	91.6 lbs	Pass
Supply Storage Chamber	6.24 lbs	9 g fwd	56.16 lbs	91.6 lbs	Pass
		6 g down	37.44 lbs	91.6 lbs	Pass
		2g side	12.48 lbs	91.6 lbs	Pass
		2 g up	112.48 lbs	91.6 lbs	Pass
Chamber Flanges (4)				91.6 lbs	Pass
Experiment Chamber	8.74 lbs	9 g fwd	78.7 lbs	91.6 lbs	Pass

attachment to Base Plate		6 g down 2g side 2 g up	52.44 lbs 17,48 lbs 17.48 lbs	91.6 lbs 91.6 lbs 91.6 lbs	Pass Pass Pass
Supply Storage Chamber attachment to Base Plate	6.24 lbs	9 g fwd 6 g down 2g side 2 g up	56.16 lbs 37.44 lbs 12.48 lbs 112.48 lbs	91.6 lbs 91.6 lbs 91.6 lbs 91.6 lbs	Pass Pass Pass Pass

Pull Test Images:

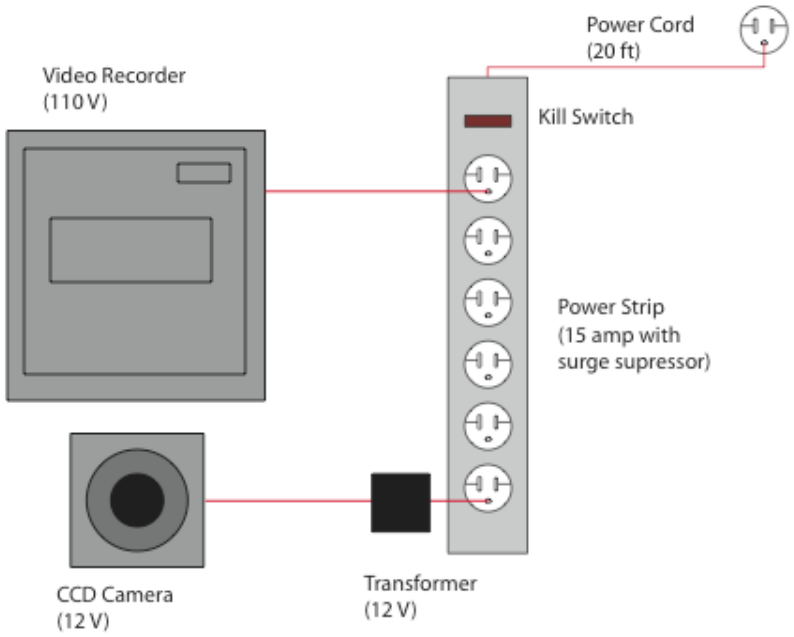
1. **Testing Base Plate – Vertical**
2. **Testing Base Plate - Lateral**
3. **Testing Experiment Chamber - Lateral**
4. **Testing Experiment Chamber Mountng Flanges**
5. **Testing Chamber attachment to Base Plate – Vertical**
6. **Completed Structure**





10. Electrical Analysis:

Schematic:



Load Table:

Device	Voltage	Amperage
PC-182XS Camera	12 V	100mA
Light meter*	9 V - DC	2.7mA

Device	100-240 V	Frequency	Wattage
Sony GVD-200 Video Recorder	100-240 V	50/60 HZ	23 W

* The light meter is independent from the aircraft power system.

Emergency Shutdown Procedures – The power strip has the master kill switch for cutting power to the camera and recorder. The light meter has its own power switch.

11. Pressure/Vacuum System Documentation Requirements:

Not Applicable

12. Laser Certification:

Not Applicable

13. Parabola Details and Crew Assistance:

No special parabola adjustments or crew assistance is required.

14. Institutional Review Board:

Not Applicable

15. Hazard Analysis Report Guidelines

Hazard Title – Flammable chemicals

Description of Hazard – These chemical employed may ignite if exposed to open flame or sparks.

Hazard Causes – Fire

Hazard Controls – The chemicals will be noted as flammable and that no one should expose it to any sort of fire. No special firefighting procedures are required. Simple water spray or CO2 will suffice.
Note: The flammable chemicals in individual vials and syringes will only be a few milliliters in volumn.

16. Tool Requirements:

Syringes containing luciferin, and containers containing luciferase will be brought to the Reduced Gravity facility. The luciferin and the Luciferase must be stored in a cool area such as a refrigerator prior to flight.

To be borrowed from RGO: Wrench for tightening floor bolts.

17. Photo Requirements:

No special requirement other than general photo documentation of the team conducting their experiment.

18. Aircraft Loading:

A forklift will not be needed to place the experiment inside the plane.

19. Ground Support Requirements

No special ground support will be required

20. Hazardous Material

The chemicals (used here in small quantities) are combustible and should not be exposed to open flame.

21. Material Safety Data Sheets:

Material Safety Data Sheet
May be used to comply with
OSHA's Hazard Communication Standard
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY	Part #95-1263
Luciferase 35mg	MSDS 96-3148

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name	Emergency Telephone Number
Neo/SCI Corporation	1-800-526-6689
Address (Number, Street, City, State, and ZIP Code)	Telephone Number for Information
210 Commerce Drive	1-800-526-6689
	Date Prepared
P.O. Box 22729	7/10/2002
	Signature of Preparer Kenneth G. Rainis
Rochester, NY 14692-2729	

Section II - Hazardous Ingredients/Identity Information

	OSHA PEL	ACGIH TLV	Other Limits Recommended	%
Luciferase (CAS 9014-00-0)	NE	NE	NE	100.0

CAUTION! CONTACT MAY CAUSE SKIN & EYE IRRITATION. MAY PRODUCE ALLERGIC REACTION IF INGESTED.

Section III - Physical/Chemical Characteristics

Boiling Point		Specific Gravity (H_2O = 1)	NA
NA			
Vapor Pressure (mm Hg)		Melting Point	
not listed		(599°F)	315°C
Vapor Density (AIR = 1)		Evaporation rate	
Not Listed		(Ether = 1) non-volatile	NA

Solubility in Water
Soluble

Appearance and Odor
Crystalline powder.

Section IV - Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits in air	LEL	UEL
Combustible (>200°C)	% by volume NA	NA	NA

Extinguishing Media
Use any media for extinguishing the supporting fire.

Special Firefighting Procedures
None required.

Autoignition Temperature:
NA

Unusual Fire and Explosion Hazards
NA

Not DOT regulated.

Section V - Reactivity Data

Stability			Conditions to Avoid
	Unstable		Thermal decomposition may release carbon monoxide, carbon dioxide, and nitrogen oxides.
	Stable	X	

Incompatibility (Materials to Avoid)
Oxidizing agents.

Polymerization			Conditions to Avoid
	Will Not Occur	X	NA

Section VI - Health Hazard Data

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	Yes	Yes	Yes

Health Hazards (Acute and Chronic)

Use good laboratory technique when handling this material. May be an inhalation and contact irritant upon prolonged contact. Exercise appropriate procedures to minimize potential hazards.

Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
No	No	No	No

LD50-LC50 Mixture: >250mg/kg

Signs and Symptoms of Exposure

May cause irritation to the skin, eyes, and mucous membranes. Avoid skin and eye contact; do not ingest.

Medical Conditions

Emergency and First Aid Procedure

INHALATION: Irritant; avoid creating and breathing dusts.

INGESTION: May be irritating to gastrointestinal tract.

EYES: Flush thoroughly with water, lifting lower and upper eyelids with water for at least 15 min. lifting eyelids. Get medical attention if irritation persists. **SKIN:** Wash with mild soap and water.

Section VII - Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled

Sweep up, place into container; avoid creating dusting conditions.

Waste Disposal Method (These guidelines are intended for listed quantity only.)

Insoluble in water; do NOT dispose to sanitary sewer. Discharge may be subject to Federal, State and Local laws.

Precautions to be Taken in Handling and Storage (Keep container tightly closed when not in use.)

Store in a cool, dry place. Wash thoroughly after handling.

Other Precautions:

For lab use only. Not for drug, food, or cosmetic use. Keep out of reach of children. Wash hands after handling.

Section VIII - Control Measures

Respiratory Protection (Specify Type)

None needed.

Ventilation	Local Exhaust	Special
	Not required.	No
	Mechanical (General)	Other
	Not required.	No

Protective Gloves

None needed.

Other Protective Clothing or Equipment

Chemical safety goggles (recommended), lab coat, apron, eye wash station in close proximity, within 15 sec. of work station.

Work/Hygienic Practices

Wash hands with soap and water following the handling of this material.

Use under direct supervision of a qualified individual knowledgeable in all aspects of laboratory safety. This product is intended for lab use only. Not for drug, food, or cosmetic use.

THE ABOVE INFORMATION IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. HOWEVER, WE MAKE NO WARRANTY OR MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, WITH RESPECT TO SUCH INFORMATION, AND WE ASSUME NO LIABILITY RESULTING FROM SUCH USE. USERS SHOULD MAKE THEIR OWN INVESTIGATION TO DETERMINE SUITABILITY OF THIS INFORMATION TO THEIR PARTICULAR PURPOSES.

Material Safety Data Sheet

May be used to comply with
OSHA's Hazard Communication Standard
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY	Part #95-1261
Luciferin 2mg	MSDS 96-3147

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturers Name	Emergency Telephone Number
Neo/SCI Corporation	1-800-526-6689
Address (Number, Street, City, State, and ZIP Code)	Telephone Number for Information
210 Commerce Drive	1-800-526-6689
P.O. Box 22729	Date Prepared 7/10/2002
Rochester, NY 14692-2729	Signature of Preparer Kenneth G. Rainis

Section II - Hazardous Ingredients/Identity Information

	OSHA PEL	ACGIH TLV	Other Limits Recommended	%
Luciferin (coelenterazine) (CAS 55779-48-1)	NE	NE	NE	100.0

CAUTION! CONTACT MAY CAUSE SKIN & EYE IRRITATION. MAY PRODUCE ALLERGIC REACTION IF INGESTED.

Section III - Physical/Chemical Characteristics

Boiling Point		Specific Gravity (H_2O = 1)	NA
NA			
Vapor Pressure (mm Hg)		Melting Point	
not listed		(599°F)	315°C
Vapor Density (AIR = 1)		Evaporation rate	
Not Listed		(Ether = 1) non-volatile	NA

Solubility in Water
Insoluble

Appearance and Odor
Orange-red crystalline powder.

Section IV - Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits in air	LEL	UEL
Combustible	% by volume NA	NA	NA

Extinguishing Media
Use any media for extinguishing the supporting fire.

Special Firefighting Procedures
None required.

Autoignition Temperature:
NA

Unusual Fire and Explosion Hazards
Slight fire hazard when exposed to heat or flame.

Not DOT regulated.

Section V - Reactivity Data

Stability			Conditions to Avoid
	Unstable		Thermal decomposition may release acrid smoke and irritating fumes.
	Stable	X	

Incompatibility (Materials to Avoid)
None known.

Polymerization			Conditions to Avoid
	Will Not Occur	X	NA

Section VI - Health Hazard Data

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	Yes	Yes	Yes

Health Hazards (Acute and Chronic)
Use good laboratory technique when handling this material. May be an inhalation and contact irritant upon prolonged contact.
Exercise appropriate procedures to minimize potential hazards.

Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
No	No	No	No

LD50-LC50 Mixture: >250mg/kg

Signs and Symptoms of Exposure
May cause irritation to the skin, eyes, and mucous membranes.
Avoid skin and eye contact; do not ingest.

Medical Conditions

Emergency and First Aid Procedure
INHALATION: Irritant; avoid creating and breathing dusts.
INGESTION: May be irritating to gastrointestinal tract.
EYES: Flush thoroughly with water, lifting lower and upper eyelids with water for at least 15 min. lifting eyelids. Get medical attention if irritation persists. **SKIN:** Wash with mild soap and water.

Section VII - Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled
Sweep up, place into container; avoid creating dusting conditions.

Waste Disposal Method (These guidelines are intended for listed quantity only.)
Follow applicable regulations.
Discharge may be subject to Federal, State and Local laws.

Precautions to be Taken in Handling and Storage (Keep container tightly closed when not in use.)
Store in a cool, dry place.
Wash thoroughly after handling.

Other Precautions:
For lab use only. Not for drug, food, or cosmetic use. Keep out of reach of children. Wash hands after handling.

Section VIII - Control Measures

Respiratory Protection (Specify Type)
None needed.

Ventilation	Local Exhaust	Special
	Not required.	No
	Mechanical (General)	Other
	Not required.	No

Protective Gloves
None needed.

Other Protective Clothing or Equipment
Chemical safety goggles (recommended), lab coat, apron, eye wash station in close proximity, within 15 sec. of work station.

Work/Hygienic Practices
Wash hands with soap and water following the handling of this material.

Use under direct supervision of a qualified individual knowledgeable in all aspects of laboratory safety. This product is intended for lab use only. Not for drug, food, or cosmetic use.

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MATERIAL SAFETY DATA SHEET

ALDON CORPORATION
1533 W. Henrietta Rd.
Avon, New York 14414
(716) 226-6177

MSDS No. EE 80
Effective Date February 23, 1999

SECTION I NAME — 24 HOUR EMERGENCY ASSISTANCE

Product	EHTYL ALCOHOL, DENATURED
Chemical Synonyms	Ethanol, Propriety Solvent, 190 Proof
Formula	Mixture.
Unit Size	up to 20Lt.
C.A.S. No.	Mixture.

CHEMTREC 800-424-9300
Day 716-226-6177

NFPA HAZARD RATING (LEAST 0, SLIGHT 1, MODERATE 2, HIGH 3, EXTREME 4)

HMIS *

Health	3
Fire	4
Reactivity	2

SECTION II INGREDIENTS OF MIXTURES

Principal Component(s)	%	TLV Units
Ethyl Alcohol, denatured: (CAS No. 64-17-5)	85.7%	PEL/TLV 1000 ppm
Water: (CAS No. 7732-18-5)	7.0%	None established.
Methyl Alcohol: (CAS No. 67-18-1)	3.6%	TWA: 200 ppm; STEL: 250 ppm (skin)
DANGER! FLAMMABLE. HARMFUL IF SWALLOWED.		

SECTION III PHYSICAL DATA

Melting Point (°F)	-173°C (-173°F) *	Specific Gravity (H_2O = 1)	0.814 @ 60°F
Boiling Point (°F)	75-80°C (163-174°F) *	Percent Volatile by Volume (%)	100%
Vapor Pressure (mm Hg)	Ca 44.6 @ 68°F *	Evaporation Rate (= Butyl Acetate =1)	4.1
Vapor Density (Air=1)	Ca 1.59 *		
Solubility in Water	Complete.		
Appearance & Odor	Clear, colorless, mobile liquid; mild characteristic odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)	(19°C) 50°F TCC.	Flammable Limits in Air % by Volume Pure Ethyl Alc.	Lower 3.3 (Et. Alc.)	Upper 19.0 (Et. Alc.)
Extinguisher Media	Water spray, carbon dioxide (CO_2); dry chemical (ABC); alcohol-type, or universal-type foams.			

SPECIAL FIREFIGHTING PROCEDURES

Wear a NIOSH/MSHA-approved self-contained breathing apparatus and protective clothing. Water spray may be used to keep fire exposed containers cool.
Autoignition Temperature: 363°C (685°F)

Contains Centrowet
Methyl Isobutyl Kerone: (CAS No. 108-10-1) ..1.9%...TWA: 50 ppm; STEL: 75 ppm.
Ethyl Acetate: (CAS No. 141-78-6)...0.8%...TWA: 400 ppm.
Rubber hydrocarbon Solvent: (CAS No. 64742-89-8)...0.8%...TI W/TWA: 490 ppm.
* For Pure Ethyl Alcohol

UNUSUAL FIRE AND EXPLOSION HAZARDS

Vapors formed from this product may travel or be moved by air currents and ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at location distant from handling point. **CAUTION:** Flame may not be visible in daylight. Fire or excessive heat may produce hazardous decomposition products; can react vigorously with oxidizing materials.

(1996 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.7, GUIDE PAGE NO. 127)

D.O.T. DENATURED ALCOHOL, 3, NA 1987, PG II

Approved by U.S. Department of Labor "essentially similar" to form OSHA-20

SECTION V HEALTH HAZARD DATA — EE80

Threshold Limited Value

Ethyl Alcohol TWA: 1000 ppm; 1880 mg/m³ (Air). Methanol TWA: 200 ppm; 262 mg/m³(Skin); Ethyl Acetate TWA: 400 ppm; 1440 mg/m³ (Air).(ACGIH 1992-93).

Effects of Overexposure

TARGET ORGANS AFFECTED: Eyes, central nervous system, liver, kidneys. INGESTION: Causes dizziness, drowsiness, decreased reaction, euphoria, nausea, vomiting, staggering gait, and coma. INHALATION: May cause dizziness, drowsiness, nausea and vomiting, inability to concentrate and irritation of the throat. SKIN CONTACT: Irritation and defatting of skin on prolonged contact. EYE CONTACT: May cause blindness.

Emergency and First Aid Procedures

INGESTION: Do NOT give anything by mouth to an unconscious or very drowsy person. If conscious, have victim drink several glasses of water. Call physician or Poison Control Center immediately. Induce vomiting if advised by physician or Poison Control Center. SKIN: Flush thoroughly with water, then wash with mild soap and water. INHALATION: Remove to fresh air. Give artificial respiration if not breathing. Oxygen may be given by qualified personnel if breathing is difficult. Obtain medical attention. EYES: Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention.

SECTION VI REACTIVITY DATA

Stability		Conditions to Avoid
Unstable		Heat, fire, ignition source.
Stable	X	

Incompatibility (Materials to Avoid)

Concentrated nitric or sulfuric acid; contact with Acetyl chloride and strong oxidizing agents may react violently.

Hazardous Decomposition Products

Thermal decomposition or burning can produce carbon monoxide and/or carbon dioxide.

Hazardous Polymerization		Conditions to Avoid
May Occur	Will Not Occur	
	X	Not applicable.

SECTION VII SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled

Remove all sources of ignition, provide adequate ventilation. For small spills, dilute with water and flush to sewer with copious amounts of water or absorb on vermiculite, paper, earth or other absorbent. Burn in an approved incinerator or open pit away from buildings and people.

Waste Disposal Method

Discharge, treatment, or disposal may be subject to Federal, State or Local laws. These disposal guidelines are intended for the disposal of catalog-size quantities only.

Dispose of in an approved incinerator or contract with a licensed waste disposal service.

SECTION VIII SPECIAL PROTECTION INFORMATION

Respiration Protection (Specify Type) For normal laboratory use at room temperatures none should be needed with adequate room ventilation. If required work in fume hood. Do not use in confined area.

Ventilation				
Local Exhaust	Recommended.	Special	No.	
Mechanical (General)	Recommended.	Other	Adequate to maintain below exposure limits.	

Protective Gloves	Rubber.	Eye Protection	Chemical safety glasses.

Other Protective Equipment Smock, apron, eye wash station, goggles, fire extinguisher, proper gloves.

SECTION IX SPECIAL PRECAUTIONS

Precautions to be Taken in Handling & Storing

Store in a cool, dry, well-ventilated area, away from any fire hazard. Use with adequate ventilation. Do not take internally.

Keep container tightly closed when not in use.

Other Precautions Read label on container before using. Do not wear contact lenses when working with chemicals.

Wash thoroughly after handling.
Remove and wash contaminated clothing.

For laboratory use only. Not for drug, food or household use. Keep out of reach of children.

Revision	Date	Approved	
No. 9	2/23/99	Michael Reszeja	Chemical Safety Coordinator MR

22. Experiment Procedures Documentation

Loading – A forklift will not be needed to place the experiment inside the plane. The experiment will be strapped down to secure its position on the plane.

Pre-Flight – The equipment will be tested prior to flight.

Take-off/Landing – No special procedures.

In-Flight – The team will install the syringe and initiate the first reaction. Following data collection, vials will be switched and additional reactions will be initiated.

Post-Flight – No special procedures

Off-Loading – The chemicals should be placed in a cool storage area such as a refrigerator for use the following day.

23. Bibliography:

-“Biol 3211 Lecture 8-1.” Regents of the University of Minnesota College of Biological Sciences. Oct. 1999. 19 Apr. 2001.

-Travis, John. “Following the Inner Light.” Science News Online . 5 Oct. 1996. Science Services, Inc., 1996 19 Apr. 2001.